

Attorney Docket No. 60896 (70551)
Application Ser. No. 10/787,037
Applicant: A. Sugiyama

Examiner: Karla A. Moore
Art Unit: 1792

Remarks

As detailed in Applicants' reply to the Final Office Action, the general thrust of the principal arguments presented to the Examiner related to the failure of the Okamura et al. reference to disclose at least the following claimed attributes:

- the provision of a gas supply to the treatment space by an inlet in the first electrode, and simultaneously the provision of a gas exhaust from the treatment space by an outlet in the second electrode, with both electrodes facing the surface of the object being treated.
- The conversion of the gas to plasma in the space immediately overlying the surface of the object being treated.
- The availability of substantially all of the supplied gas for treatment of the object, and the exhausting of the plasma from the supplied gas through the outlet in the second electrode.
- The advantages of a plasma flow that is substantially parallel to the surface of the object being treated, which avoids perpendicular impingement of plasma gas onto the surface of the object.

The applicants' representatives pointed out that Okumura et al. fails to teach the placement of a gas inlet in one electrode, and a gas outlet in the second electrode, both facing the surface of the object being treated and generating a plasma as the gas flows parallel to the surface of the object. In Okumura et al., the plasma is formed in a space between two facing electrodes, in a manner designed to cause plasma to forcefully impinge the surface of the object being treated. See, e.g., Figs. 10, 11A, 11B, 16, 21, 25 (prior art) and 29A. In every case, the plasma is formed in a plasma space 3 in a manner that it is directed against the surface of the substrate to be treated. Although it is disclosed that the gas can be supplied to that space through the electrode itself, that makes no difference in the operation of Okumura as far as the present claims are concerned. The plasma is still formed between the electrodes and shot down to impinge the substrate surface. There is no disclosure or suggestion of the concept of

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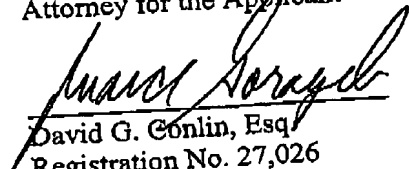
on the opposite side of the second electrode from the first electrode, the structure would not be symmetrical with respect to the second electrode.

CONCLUSION

Applicants' representatives sincerely thank Examiner Moore for her time and attention to this application. In view of the foregoing remarks, favorable reconsideration and withdrawal of all rejections, and allowance of this application are respectfully solicited. Should any fee be required for this submission to be considered (including extensions of time), the Commissioner is authorized to charge deposit account number 04-1105.

Respectfully submitted,
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supplying it through the electrode through the first dielectric surface which opposes the substrate surface and is located between the object and the first electrode (claim 1, third and fourth paragraphs). Nor is there a disclosure of simultaneously exhausting the processing gas through an exhaust opening through a second surface which also opposes the surface of the substrate (claim 1, third and fifth paragraphs). The concept of forming and moving the plasma parallel to the surface of the substrate is foreign to Okumura. If, as required by the third paragraph of claim 1, the dielectric completely filled the space between the electrodes (i.e., plasma space 3) in Okumura, that device would not work at all. Nothing in any of the other references of record, or any reasonable combination of them, makes up for the contrary teachings of Okumura.

It was noted that dependent claim 4 even more specifically recites that the coated surfaces of the first and second electrodes extend on a plane parallel to the surface of the object.

The applicant's representatives also noted that much of the plasma formed according to Okumura et al. appears to be exhausted before ever contacting the surface of the object being treated. In fact Okumura et al. teaches that exhausting 70% or more of the gas via the gas exhaust outlet helps to prevent the exhausting of gas from the opening overlying the object being treated. (Okumura et al. at para. 0158). In contrast, Applicants' invention is capable of utilizing substantially all of the plasma generated to treat the object, and is also capable of exhausting substantially all of the plasma through the second electrode after it passes over the object, as recited in dependent claim 9. The Okumura et al. device cannot function effectively unless at least some of the plasma escapes along the opening overlying the object being treated.

Although claim 12 was not specifically discussed during the interview, Applicants' representatives also wish to respond herein to the September 18, 2007 Advisory Action comments regarding that claim. Claim 12 recites a third electrode positioned next to the second electrode opposite the first electrode, and requires that the apparatus is formed in symmetry with respect to the second electrode. Electrode polarity is inherently part of this symmetry, since if a third electrode of the same polarity as the second electrode were placed